

## Original Research Article

# Maternal mortality due to thermal injury in pregnancy

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### ABSTRACT

**Background:** Human physiology is altered during pregnancy and adds further stress to systems that are already modified. Mother and foetus are placed at increased risk by burns injury, which is often associated with a high rate of both fetal and maternal mortality and morbidity.

**Methods:** All pregnant patients with burns injuries admitted at our tertiary hospital under department of general surgery from June 2017 to May 2019. This study included 20 pregnant patients with burns injury.

**Results:** Of the total 20 cases, the percentage of TBSA varied from 5% to 100%. There were 19 cases of accidental burns and one case of homicidal burns. There were 11 preterm deliveries of which two stillbirths and nine spontaneous abortions occurred. In all, ten out of twenty mothers died after severe burns amounting to total maternal mortality at 50%.

**Conclusions:** Burns during pregnancy demands special management and requires early and adequate resuscitation with the use of a limited choice of antibiotics and local antibacterial agents. Early surgical intervention and a special obstetric protocol are required in the management of these patients to improve maternal outcome.

**Keywords:** Burns, Thermal, Fetal, Maternal, Mortality

### INTRODUCTION

Human physiology alters during pregnancy and adds further stress to systems that are highly modified.<sup>1</sup> Mother and foetus are placed at increased risk due to burns, which is often associated with a high rate of both fetal and maternal mortality and morbidity. Burns injuries are a serious public health problem which is described as injury to skin or other organic tissue primarily caused by heat, radiation, radioactivity or due to chemicals or electric current. In India males and females are almost equally at risk for burns with females being more vulnerable due to cooking, loose clothes, etc.<sup>2</sup> The incidence of burns during pregnancy is around 6.8% to 7.8% of all pregnancies.<sup>2</sup> The maternal outcome is directly related to the extent of burns. Timely and aggressive resuscitation including early control of the airway with obstetric management including early delivery of the fetus is vital for optimal maternal and

fetal outcome.<sup>2</sup> The objective of the study was to study the morbidity and mortality in pregnant women associated with burns during pregnancy.

### METHODS

After approval of Institutional Ethics Committee, we conducted a retrospective observational study that included all pregnant patients with burns injury admitted and managed at our tertiary hospital from June 2017 to June 2019. A total of 20 cases were included in this study. All cases were managed by a combined team of obstetricians and surgeons. Baseline investigations and confirmation tests for pregnancy including urine dipstick tests and ultrasonography were done in all cases. The rule of nine is used to determine the percentage of burns according to total body surface area involved by parkland's formula. Data analysis was carried out with

primary focus towards maternal outcome. Statistical method used in the study was chi square test to calculate the p-value for various correlations.

**RESULTS**

This study included 20 pregnant patients with burns injury. All patients were of average built with normal pregnancies at the time of injury. The percentage of TBSA varied from 5% to 100%. Resuscitation was initially successful in all patients except two patients who sustained 100% burns and died within 48 hours of admission to hospital. The injuries were predominantly domestic with cooking gas cylinder blasts and hot liquids as major causative factors.

**Table 1: Cases according to different percentage of TBSA.**

Percentage TBSA (total burns surface area)	No. of cases
0-25	6
26-50	6
51-75	2
76-100	6
<b>Total</b>	<b>20</b>

**Table 2: Various modes of burns injury.**

Mode of burns injury	No. of cases	%
Accidental	19	95
Homicidal	1	5
Suicidal	0	0
<b>Total</b>	<b>20</b>	<b>100</b>

**Table 3: Number of cases observed in different gestational periods.**

Gestational period	No. of cases	%
Second trimester	11	55
Third trimester	9	45
<b>Total</b>	<b>20</b>	<b>100</b>

Gestational age at the time of injury varied from 12 weeks to 38 weeks with 11 cases presenting in second trimester and 9 patients in third trimester. Out of total 20 cases, there were 11 preterm deliveries of which 2 stillbirths and 9 spontaneous abortions occurred. Of the remaining cases there were 9 full term deliveries with 9 livebirths. In TBSA <50% - two out of total 12 mothers died while when TBSA >50% - eight out of a total of eight mothers died.

Maternal death was directly attributable to Septicemia in 8 cases and respiratory complications including initial smoke inhalation and pulmonary edema in 2 cases. Maternal mortality was 16.7% in <50% burns, while 100% in all cases more than 50% burns. In all, 10 out of 20 mothers died after sustaining severe burns amounting to

total maternal mortality at 50%. The relation between TBSA and maternal outcome is mentioned in table 4.

**Table 4: Percentage of TBSA with maternal outcome.**

TBSA	Maternal outcome			Total
	Survived	Death	% Deaths	
0-25%	6	0	0	6
26-50%	4	2	33.3	6
51-75%	0	2	100	2
76-100%	0	6	100	6
<b>Total</b>	<b>10</b>	<b>10</b>	<b>50</b>	<b>20</b>

X<sup>2</sup>= 14.67; df=3; p value= 0.002125

The relations between other various factors are given in the following tables.

The relation of % total burns surface area (TBSA) with number of cases in the present study is shown in table 1.

The relation between mode of burns injury in pregnancy with the total cases encountered for each type is shown in table 2.

The relation between gestational period during which the patient presented with the total cases during each period is shown in table 3.

Gestational age at the time of injury varied from 12 weeks to 38 weeks with 11 cases presenting in second trimester and 9 patients in third trimester.

This table has significant p value which depicts significant association between % TBSA with maternal death rate. It is indicative of rise in maternal death rate as TBSA increases.

Maternal mortality was 16.7% in <50% burns, while 100% in all cases more than 50% burns. Fetal mortality was 25% in <50% burns while it was reported as 100% in > 50% burns.

**DISCUSSION**

This study comprises twenty pregnant patients with burns injury. All patients were in second and third trimester of pregnancy. Overall, ten out of twenty mothers died after sustaining severe burns amounting to total maternal mortality at 50%. Accidental mode of injury was the most common mode of injury noted in 19 out of 20 cases.

Bartle et al conducted a retrospective cohort study from 1955-1975 of 42 pregnant females with burns injury which included three maternal deaths [7.1%].<sup>1</sup>

**Table 5: Comparison of outcome in burns of various studies and present study.**

Source	No. of patients	Maternal outcome (deaths) (%)
Bartle et al <sup>1</sup>	42	3 (7.1)
Rode et al <sup>2</sup>	33	8 (24.2)
Gautam et al <sup>3</sup>	19	10 (52.6)
Maghsoudi et al <sup>4</sup>	51	20 (39)
Agarwal et al <sup>5</sup>	49	33 (67)
Unsur et al <sup>6</sup>	11	2 (18)
Gang et al <sup>8</sup>	16	2 (12.5)
Chama et al <sup>7</sup>	21	9 (47)
Present study	20	10 (50)

Rode et al conducted a retrospective cohort study from 1986-1987 of 33 pregnant females with burns injury. There were eight maternal deaths [24%].<sup>2</sup>

Gautam et al did a retrospective study of 19 pregnant patients with burns admitted from January 2013 to January 2014. It reported 10 maternal deaths [53%].<sup>3</sup>

Maghsoudi et al conducted a 9 years prospective study involving 51 patients.<sup>4</sup> 51% of patients in their study had burns more than 40% of total body surface area, resulting in 100% foetal mortality rates. There were 20 maternal deaths. The majority were among self-inflicted burned pregnant women.

Agarwal et al conducted a study to assess the parameters that predict maternal and foetal outcome in 49 thermally injured pregnant women over five years.<sup>5</sup> There were 33 maternal deaths. It concluded that maternal survival was less likely if the burn wound exceeds 50% total body surface area.

Unsur et al conducted a retrospective study on 917 burn victims between 1986 and 1994 on 11 pregnant patients affected by burns.<sup>6</sup> Two maternal deaths (18%) occurred in both patients with burns involving more than 50% of the skin surface area.

Gang et al conducted a study on 16 patients at various stages of pregnancy with burns between 10 and 80 per cent of the body surface area.<sup>7</sup> Only two mothers (both with 80 per cent TBSA burns) died.

Chama et al did a study with a total of 21 cases of severe burns in pregnancy managed at the University of Maiduguri Teaching Hospital, Maiduguri, over a 10-year period, spanning January 1991- December 2000 inclusively were reviewed.<sup>8</sup> Maternal mortality was 47.6% with sepsis as the most common cause of death.

The study similar to our study is by Gautam et al which had a similar sample size [n=19].

Maternal mortality in their study is similar at 53% against 50% in our study. In both studies, there is 100% maternal and fetal mortality for patients with TBSA more than 50%.

On comparing outcome between this study and studies conducted in western countries, there is higher mortality in our study probably due to patients belonging to a lower socioeconomic strata. These comprise the majority of cases admitted at our institute and do not have adequate financial resources and nutritional support for proper healthcare. Also patients in our study have a greater extent of burn surface area involved with greater severity of injury. There is disparity in our study with the study by Bartle et al, owing to a longer time period over which their study was conducted and lesser burn surface area involved of their patients, making it incomparable.

A variable incidence has been reported from different centres. Of the 379 cases reported in the literature between 1958 and 2000, 129 (34%) occurred in India.

Rode reported that when over 50% of the total body area was burned, the mother's survival was unlikely. In the study carried out by Gang, two cases of death were observed among women with burns in over 80% of total body area. The difference in the results could be attributed to the difference in the facilities available in centres, the experience of the physicians in charge, and causes of the burns.

We observed a statistically significant relationship between severity of burn and foetal and maternal mortality rates. This is consistent with the findings of Unsur, Rode, Gang, and Chama, who reported that maternal and foetal mortality rates were directly related to the severity of burn.<sup>2,6-8</sup> The severity of injuries due to burns and the consequent water and fluid disturbance would appear to directly threaten the life of both mother and foetus. We did not observe a significant relationship between burn injury in pregnancy and the risks of abortion and premature delivery. In the studies performed by Rode and Agarwal a direct relationship was reported between the percentage of burn area and the frequency rates of abortion and premature delivery.<sup>2,5</sup> The differences could result from the difference in sample size of the studies.

It is advocated that viable pregnancies should be terminated as soon as the mother is resuscitated following severe burn injury. Prophylactic systemic antibiotics should be given to minimise the development of sepsis. A multidisciplinary approach is encouraged in managing cases of severe burns in pregnancy. As per all previous reports and also according to the results obtained, the percentage of burn area and gestational age were the most important effective factors in the prognosis and outcome of mother.

Limitation of this study- this study is time bound restricted to data collected in a span of 2 years at a tertiary care hospital. Patients admitted to this hospital belong to a low

socioeconomic strata and have limited financial resources causing delay in access to healthcare.

## CONCLUSION

Burns in pregnancy have a limited literature. A variable incidence has been reported from different centres. Burns injury less than 50% surface area can be successfully managed conservatively. There is high fetal and maternal mortality for burns more than 50% surface area. This clinical scenario demands special management and requires early and adequate resuscitation with the use of a limited choice of antibiotics and local antibacterial agents owing to pregnancy. Early surgical intervention and a special obstetric protocol are required in the management of these patients to improve maternal outcome.

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